What is claimed is:

1. A chromatographic system comprising:

a pumping system;

a column and detector array;

a collector system; and

a controller;

said column and detector array including a plurality of columns;

each of said columns containing a corresponding one of a plurality of size-compensated polymeric plugs;

each of said size-compensated polymeric plugs having the same characteristics, whereby said columns separate sample in a similar manner;

a source of solvent;

said pumping system being arrange to supply solvent from the source of solvent to the column and detector array under the control of the controller wherein effluent flows into the collector system from the column and detector array under the control of the controller;

said controller being connected to receive signals from detectors in the column and detector array indicating bands of solute and to activate the fraction collector accordingly.

2. A chromatographic system according to claim 1 in which;

said solvent is supplied to a pump array having a different one of a plurality of

pumps in said pump array communicating with each a corresponding one of said plurality of columns in said column and detector array; and

a motor driven under the control of said controller to drive the array of pumps.

3. A chromatographic system comprising:

a sample injector;

at least one chromatographic column having a column casing and at least one permeable monolithic polymeric plug inside the column casing positioned to receive a sample from the sample injector;

a solvent system in communication with the chromatographic column for supplying a solvent to the at least one column, whereby the sample is separated into its components within the at least one column;

said column casing including a column casing wall with an internal column casing surface;

said at least one permeable monolithic polymeric plug with smooth walls without discontinuities in contact with an internal surface of the column walls; and

a utility device for receiving fluid from said column.

4. A chromatographic system according to claim 3 in which said at least one permeable monolithic polymeric plug is a size-compensated polymeric plug.

5. A chromatographic system in accordance with claim 3 in which said at least one

chromatographic column includes a plurality of columns.

6. A chromatographic system in accordance with claim 3 in which the utility device is a detector.

7. A chromatographic system in accordance with claim 3 in which the utility device is a fraction collector.

8. A chromatographic system in accordance with claim 3 in which the at least one column is a capillary column.

9. A chromatographic system in accordance with claim 3 in which the at least one column is a portion of a microchip.

10. A chromatographic system in accordance with claim 3 in which the permeable monolithic polymeric plug includes divinylbenzene.

11. A chromatographic system in accordance with claim 3 in which the permeable monolithic polymeric plug includes glycidyl methacrylate with hydrophobic surface groups.

12. A chromatographic system in accordance with claim 3 in which the permeable monolithic polymeric plug includes urea formaldehyde.

13. A chromatographic system in accordance with claim 3 in which the permeable monolithic polymeric plug includes silica.

14. A chromatographic system in accordance with claim 9 in which the column casing is glass.

15. A chromatographic system in accordance with claim 9 in which the column casing is steel.

16. A separating system comprising:

a permeable size-compensated polymeric support;

a sample injector positioned to inject sample onto the support of permeable size-compensated polymer;

a solvent system in communication with the support of permeable size-compensated polymer, whereby the sample is separated into its components within the separating system; and

a utility device positioned to receive fluid from said permeable size-compensated polymeric support.

17. A separating system in accordance with claim 16 in which the utility device is a detector.

18. A separating system in accordance with claim 16 in which the permeable size-compensated polymeric support has the structure of FIG. 5.

19. A method of performing chromatography comprising the steps of:

applying a sample to a chromatographic column having column casing and a size compensated polymer monolithic packing; and

supplying a solvent to the chromatographic column, whereby the sample is separated into its components within the chromatographic column.

20. A method in accordance with claim 19 further including the step of causing said solvent to flow into a utility device.

21. A method in accordance with claim 20 in which the step of causing said solvent to flow into a utility device includes the step of causing said solvent to flow into a detector.

22. A method in accordance with claim 20 in which the step of causing said solvent to flow into a utility device includes the step of causing said solvent to flow into a fraction collector.

23. A method in accordance with claim 20 in which the step of causing said solvent to flow into a utility device includes the step of causing said solvent to flow into a detector.

24. A method in accordance with claim 20 in which the step of causing said solvent to flow into a utility device includes the step of causing said solvent to flow into another instrument.

25. A method in accordance with claim 19 in which the step of applying a sample to a chromatographic column having column casing and a size compensated polymer monolithic packing includes the step of applying a sample to permeable monolithic polymeric plug that includes a vinyl group.

26. A method in accordance with claim 19 in which the step of applying a sample to a chromatographic column having column casing and a size compensated polymer monolithic packing includes the step of applying a sample to permeable monolithic polymeric plug that includes urea formaldehyde.

27. A method in accordance with claim 19 in which the step of applying a sample to a chromatographic column having column casing and a size compensated polymer monolithic packing includes the step of applying a sample to permeable monolithic polymeric plug that includes a silica polymer.

28. A chromatographic system comprising:

a sample injector;

at least one chromatographic column having a column casing and at least one

permeable monolithic polymeric plug inside the column casing positioned to receive a sample from the sample injector;

a solvent system in communication with the chromatographic column for supplying a solvent to the at least one column, whereby the sample is separated into its components within the at least one column;

said column casing including a column casing wall with an internal column casing surface;

said at least one permeable monolithic polymeric plug having the structure shown in FIG. 9 when magnified 4.5 thousand times;; and

a utility device for receiving fluid from said column.

29. A chromatographic system according to claim 3 in which said at least one permeable monolithic polymeric plug is a size-compensated polymeric plug.

30. A separating system comprising:

a permeable size-compensated polymeric support having the internal structure shown in FIG. 5 when magnified 9 thousand times;

a sample injector positioned to inject sample onto the support of permeable size-compensated polymer;

a solvent system in communication with the support of permeable size-compensated polymer, whereby the sample is separated into its components within the separating system; and

a utility device positioned to receive fluid from said permeable size-compensated polymeric support.

31. A chromatographic column comprising:

a chromatographic column support having internal column walls;

a monolithic permeable plug in said column walls;

said permeable monolithic polymeric plug being a polymer having separation-effective openings of a controlled size formed in the polymer by a porogen in the polymerization mixture before polymerization and controlled in size at least partly by pressure during polymerization.

32. A chromatographic column in accordance with claim 31 in which the permeable monolithic polymeric plug has smooth walls.

33. A chromatographic column in accordance with claim 31 wherein there are substantially no pores within the permeable monolithic polymeric plug.

34. A chromatographic column in accordance with claim 31 wherein the permeable monolithic polymeric plug is free of channeling openings in the walls of the plug.

35. A chromatographic column in accordance with claim 31 wherein the permeable

monolithic polymeric plug is formed principally of methacrylate.

36. A chromatographic column in accordance with claim 31 wherein the permeable monolithic polymeric plug is formed principally of methacrylate with hydrophobic surface groups.

37. A chromatographic column in accordance with claim 31 wherein the permeable monolithic polymeric plug is formed principally of urea formaldehyde.

38. A chromatographic column in accordance with claim 31 wherein the permeable monolithic polymeric plug is formed principally of silica.

39. A chromatographic column in accordance with claim 31 wherein the permeable monolithic polymeric plug is principally formed of polymers of glycidyl methacrylate and of ethylene dimethacrylate in a ratio by weight in the range of from 1 to 1 and 2 to 1.

40. A chromatographic column in accordance with claim 31 wherein the permeable monolithic polymeric plug is principally formed of polymers of glycidyl methacrylate and of ethylene dimethacrylate in a ratio by weight of 3 to 2.

41. A column in accordance with claim 31 in which the permeable monolithic

polymeric plug includes as its principal component a mixture of divinylbenzene and styrene in a ratio in the range of 3 to 1 and 9 to 1.

42. A column in accordance with claim 31 in which the permeable monolithic polymeric plug includes as its principal component a mixture of divinylbenzene and styrene in a ratio in the range of 4 to 1.

43. A column in accordance with claim 31 in which the column is in the range of 35 percent and 80 percent by weight divinylbenzene.

44. A column in accordance with claim 43 in which the column is 64 percent by weight divinylbenzene.

45. A weak ion exchange chromatographic column comprising:

a chromatographic column support having internal column walls;

a permeable monolithic polymeric plug in said column walls;

said permeable monolithic polymeric plug being formed principally of methacrylate polymer and having smooth walls.

46. A weak ion exchange chromatographic column comprising:

a chromatographic column support having internal column walls;

a permeable monolithic polymeric plug in said column walls;

said permeable monolithic polymeric plug being formed principally of polymers of glycidyl methacrylate and of ethylene dimethacrylate in a ratio by weight in the range of from 1 to 1 and 2 to 1.

47. A chromatographic column in accordance with claim 45 wherein the permeable monolithic polymeric plug is principally formed of polymers of glycidyl methacrylate and of ethylene dimethacrylate in a ratio by weight of 3 to 2.

48. A chromatographic column comprising

a chromatographic column support having internal column walls;

a permeable monolithic polymeric plug in said column walls;

said permeable monolithic polymeric plug being formed principally of a mixture of divinylbenzene and styrene and having smooth walls.

49. A chromatographic column in accordance with claim 65 in which the ratio of divinylbenzene and styrene is in the range of 3 to 1 and 9 to 1 by weight.

50. A column in accordance with claim 51 in which the column is in the range of 30 percent and 80 percent by weight divinylbenzene.

51. A chromatographic column comprising:

a chromatographic column support having internal column walls;

a permeable monolithic polymeric plug in said column walls;

said permeable monolithic polymeric plug being formed principally of a mixture of divinylbenzene and styrene in a ratio of divinylbenzene and styrene in the range of 3 to 1 and 9 to 1 by weight.

52. A column in accordance with claim 51 in which the column is in the range of 30 percent and 80 percent by weight divinylbenzene.

53. A column in accordance with claim 31 further including hydrophobic surface groups.

54. A column in accordance with claim 51 further including hydrophobic surface groups.

55. A strong anion exchange column comprising:

a column support having internal column walls;

a permeable monolithic polymeric plug in said column walls;

said permeable monolithic polymeric plug being formed principally of a mixture of glycyl methylacrylate, ethyl divinylmethylacrylate in a range of ratios of a value of glycyl methylacrylate to ethyl divinylmethylacrylate in the range of ratios between 2 to 3 and 5 to

7.

56. A column in accordance with claim 55 in which the ratio of glycyl methylacrylate to ethyl divinylmethylacrylate is substantially 1 to 3.

57. A weak cation chromatographic column comprising a chromatographic column support having internal column walls;

a permeable monolithic polymeric plug in said column walls;

said permeable monolithic polymeric plug being formed principally of a mixture of methyl methacrylate, glycyl methylacrylate and ethyl divinylmethylacrylate in the ratio of a value of methyl methacrylate in a range between 9 to 11 and 2 to 3 and 11 to 13.

58. A column in accordance with claim 57 in which the ratio of methyl methacrylate, glycyl methylacrylate and ethyl divinylmethylacrylate is substantially in the range of 5 to 1 to 12.

59. Apparatus for making a chromatographic column comprising:

a temperature controlled reaction chamber adapted to contain a polymerization mixture during polymerization; and

means for applying pressure to said polymerization mixture in said temperature controlled reaction chamber.

60. Apparatus according to claim 59 in which said polymerization mixture comprises a polymer, a cross-linking reagent and a cross-linking monomer, whereby rigidity, capacity and separation-effective opening distribution are controlled by the amount of cross-linking reagent, monomer, and pressure are aided forming mer and a porogen.

61. Apparatus according to claim 59 wherein said means for applying pressure is a mean for applying pressure with a movable member.

62. Apparatus according to claim 59 in which said movable member has a smooth surface positioned to contact said polymerization mixture as pressure is applied during polymerization.

63. Apparatus for making a chromatographic column comprising:

a temperature controlled reaction chamber adapted to contain a polymerization mixture during polymerization to form a plug;

aqueous processing means for applying an aqueous solution to the plug;

means for applying pressure to said plug to reduce voids in the plug.

64. A method of making a monolithic chromatographic column comprising the steps of:

preparing a polymerization mixture;

performing polymerization under pressure, whereby sufficient pressure is applied to prevent voids from being formed caused by vacuum due to shrinkage during polymerization.

65. The method of claim 64 in which the step of performing polymerization includes the step of inserting a polymerization mixture into the walls of a chromatographic column and polymerizing in a temperature controlled chamber during at least part of the time pressure is being applied to the polymerization mixture.

66. The method of claim 65 in which the step of inserting a polymerization mixture includes the step of inserting at least one vinyl monomer, an initiator, and a porogen.

67. A method of making a monolithic chromatographic column comprising the steps of:

adding a polymerization mixture containing a porogen to a closed container;

polymerizing the mixture under pressure to form a polymer plug, whereby sufficient pressure is applied to prevent voids from being formed caused by vacuum due to shrinkage during polymerization; and

washing the polymer plug to remove the porogen.

68. A method of making a monolithic chromatographic column comprising the steps of:

preparing a polymerization mixture including a porogen;

performing polymerization to form a polymer plug;

washing the polymer plug to remove the porogen, wherein the plug tends to swell; and

applying pressure to prevent swelling of the polymer plug and eliminate voids.

69. A method of making a monolithic permeable device for separating the components of a sample, comprising the steps of:

preparing a polymerization mixture including a monomer and a porogen wherein the porogen includes a mixture of alcohols;

said porogen comprising first and second alcohols in a ratio of a first value in the range of a value between 1.8 and 2 to a value between 1.25 and 1.35, wherein the first value wherein the first alcohol is ethanol and the second alcohol is butanol.

70. A method of making a monolithic permeable device for separating the components of a sample, comprising the steps of:

preparing a polymerization mixture including a monomer and a porogen wherein the porogen includes a mixture of alcohols;

said porogen comprising first, second and third alcohols in a ratio of a first value in the range of a value between 2.8 and 3 to a second value in the range of 0.3 to 0.35 and a third value in the range of 0.3 to 0.35 wherein the first alcohol is ethanol, the second alcohol is methanol and the third alcohol is isopropanol.

71. A polymerization mixture comprising divinylbenzene, styrene, an initiator and a porogen, wherein the divinybenzene and styrene are in the ratio in the range of 3 to 1 and 9 to 1.

72. A polymerization mixture in accordance with claim 71 wherein the divinybenzene and styrene are in the ratio of 4 to 1.

73. A polymerization mixture in accordance with claim 72 in which the proportions of divinylbenzene, styrene and porogen are in the ratio of 8 to 2 to 15 respectively.

74. A polymerization mixture comprising divinylbenzene, styrene and dodecanol in a proportion within the range of 7 to 9 units of divinylbenzene to 1.5 to 2.5 units of styrene to 13-17 units of dodecanol combined with an initiator.

75. A polymerization mixture according to claim 74 in which the proportions of divinylbenzene, styrene and dodecanol are 8 to 2 to 15 respectively combined with an initiator.

76. A polymerization mixture comprising divinylbenzene, styrene dodecanol and toluene in the proportions of 7-9 to 1.5-2.5 to 9-13 to 2.5-3.5 respectively, combined with an initiator.

77. A polymerization mixture according to claim 76 in which the divinylbenzene, styrene dodecanol and toluene are combined in the proportions of of 8 to 2 to 11 to 3 respectively, combined with an initiator.

78. A polymerization mixture comprising glycidyl methacrylate, ethylene glycol dimethacrylate, cyclohexanol and dodecanol in the proportions of 0.5-0.7 to 0.3-0.5 to 1-2 to 0.1-2.5, combined with an initiator.

79. A polymerization mixture in accordance with claim 78 in which the glycidyl methacrylate, ethylene dimethacrylate, cyclohexanol and dodecanol are in the proportions of 0.6 to 0.4 to 1.325 to 0.175 respectively.

80. A method of making a column, comprising the steps of:

weighing divinylbenzene, styrene and an initiator into a sample vial in the proportions of 3 to 5 parts of divinylbenzene to one part of styrene;

shaking the mixture of divinylbenzene, benzene, styrene and initiator gently until the mixture becomes a homogeneous solution;

weighing 13 to 17 parts of porogen into the homogeneous solution and shaking until the new mixture is homogeneous to form a polymerization solution;

degassing;

filling a stainless steel column with the polymerization solution;

sealing the stainless steel column;

polymerized the polymerization solution in the stainless steel column to form a plug;

washing the porogen from the plug using at least some water in at least one phase of the washing; and

compressing the plug by applying pressure to it in the stainless steel column.

81. The method of claim 80 in which the step of weighing divinylbenzene, styrene and an initiator into a sample vial comprises the step of weighing the divinylbenzene and styrene in the proportions of approximately 4 parts of divinylbenzene to one part of styrene, the step of weighing 13 to 17 parts of porogen comprisies the step of weighing 15 parts of dodecanol into the homogeneous solution; and the step pf polymerizing includes the step of polymerizing the polymerization solution at between 40 and 75 °C in a water bath for between 14 and 34 hours.

82. The method of claim 81 in which the step of weighing 13 to 17 parts of porogen into the homogeneous solution and shaking until the new mixture is homogeneous to form a polymerization solution comprises the step of mixing between 10 and 14 parts dodecanol and 2 and 3 parts toluene together to form a polymerization solution.

83. A method of making a column, comprising the steps of:

weighing glycidyl methacrylate, ethylene dimethacrylate and an initiator into a sample vial in the proportions of 1.5 to 4 parts of glycidyl methacrylate, to 1 to 2 parts of ethylene dimethacrylate;

shaking the mixture of glycidyl methacrylate, ethylene dimethacrylate and initiator gently until the mixture becomes a homogeneous solution;

weighing a porogen into the homogeneous solution and shaking until the new mixture is homogeneous to form a polymerization solution;

degassing;

filling a column with the polymerization solution, wherein the column includes means for applying pressure to the polymerization solution;

sealing the column;

polymerized the polymerization solution in the column under pressure to form a plug;

washing the plug to remove the porogen.

84. A method according to claim 83 in which the step of weighing glycidyl methacrylate, ethylene dimethacrylate and an initiator into a sample vial comprises the step of weighing 0.6 g of glycidyl methacrylate, 0.4 g of ethylene dimethacrylate and an initiator into a sample vial in the proportions of 3 parts of divinylbenzene to one part of styrene.

85. A method according to claim 83 in which the step of weighing a porogen into the homogeneous solution and shaking until the new mixture is homogeneous to form a polymerization solution comprises the step of weighing cyclohexanol and dodecanol into the homogeneous solution in proportions in the range of 10 parts of cyclohexanol to 1 part of dodecanol and 17 parts of cyclohexanol to 1 part dodecanol by weight.

86. A method according to claim 83 in which the step of weighing a porogen into the homogeneous solution and shaking until the new mixture is homogeneous to form a polymerization solution comprises the step of weighing cyclohexanol and dodecanol into the homogeneous solution in proportions in the range of 10 parts of cyclohexanol to 1 part of dodecanol and 17 parts of cyclohexanol to 1 part dodecanol by weight.

87. A method according to claim 83 in which the step of weighing a porogen into the homogeneous solution and shaking until the new mixture is homogeneous to form a polymerization solution comprises the step of weighing cyclohexanol and dodecanol into the homogeneous solution in proportions of 13 parts of cyclohexanol to 1.7 parts of dodecanol.

88. A method according to claim 84 in which the step of polymerizing the polymerization solution in the column under pressure to form a plug comprises the steps of polymerizing the solution under a pressure within the column of between 0.1 psi and 600 psi upright at a temperature in the range of 200 °C to 100 degrees C for a time of between 15 hours and 48 hours.

89. A method according to claim 86 further including the step of adding a catalyst to the polymerization solution diethylamine hydrogen chloride as catalyst.

90. A method according to claim 89 wherein the catalyst is diethylamine hydrogen chloride.

91. A method according to claim 89 wherein the catalyst is trimethylamine hydrogen chloride.

92. A separating medium that has the structure shown in FIG. 5.

93. A method of making a monolithic permeable device for separating the components of a sample, comprising the steps of:

preparing a polymerization mixture including a monomer and a porogen wherein the porogen includes a mixture of alcohols;

said porogen comprising first, second, third and fourth alcohols in a ratio of a value between 6 to 7 and 3 to 35 and 3 to 35 and 3 to 35 wherein the alcohols are ethanol, methanol, propanol and butanol respectively.

94. A method of controlling polymerization of a porous medium comprising the steps of:

establishing a polymerization mixture including a porogen;

controlling the rate of the polymerization with radiation and at least one substance that is caused by the radiation to affect the polymerization.

95. A method in accordance with claim 94 wherein at least one of the at least one substance that is affected by the radiation is energized to emit further radiation.

96. A method in accordance with claim 95 in which the further radiation initiates polymerization.

97. A method in accordance with claim 95 wherein at least one of the at least one substance emits radiation that energizes a second substance to emit radiation.

98. A method of controlling polymerization of a porous medium comprising the steps of:

establishing a polymerization mixture including a solvent;

controlling the rate of the polymerization with radiation and at least one substance that is caused by the radiation to affect the polymerization.

99. A polymerization mixture comprising at least one monomer, at least one porogen and at least one substance that affects polymerization in response to radiation.

100. A polymerization mixture comprising at least one monomer, at least one solvent and at least one substance that affects polymerization in response to radiation.

101. A method of making a monolithic permeable device for separating the

components of a sample, comprising the steps of:

preparing a polymerization mixture including a monomer, a porogen and at least one radiation sensitive substance;

said radiation sensitive substance comprising one or more substances selected from a group consisting of photo initiators, solvents, x-ray sensitizers and scintillators; and

irradiating the polymerization mixture.

102. A method of polymerizing a mixture to form a solid support containing at least one monomer and a porogen comprising the step of irradiating the mixure with X rays.

103. A method of polymerizing a mixture to form a solid support containing at least one monomer and a solvent comprising the step of irradiating the mixure with X rays.

104. A method in accordance with claim 103 in which the x-rays are applied axially to an elongated mixture.

105. An apparatus for polymerizing chromatographic columns comprising:

a temperature controlled reaction chamber adapted to contain a polymerization mixture during polymerization to form a plug;

radiation means for applying radiation to the plug; and

control means for controlling the radiation.

106. An apparatus in accordance with claim 105 further including means for applying pressure to the plug to reduce voids in the plug.